

**CHAT-BOT SYSTEM FOR COMPUTERS, ACCESSORIES &
REPAIR CENTER RECOMMENDATION**

TMP-23-238

Project Proposal Report

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B.Sc. (Hons) Degree in Information technology
Specialized in Data Science

Department of Information Technology

Sri Lanka Institute of Information Technology
Sri Lanka

March 2023

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Declaration

“I declare that this is our own work and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. Also, I hereby grant to Sri Lanka Institute of Information Technology, the nonexclusive right to reproduce and distribute my dissertation, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).”

Name	Student ID	Signature
Thirimanne S.U.s	IT2022506	

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

.....
.....

Dr. Lakmini Abeywardhana
(Signature of the Supervisor)

Date

Acknowledgement

I would like to express my heartiest gratitude to all who have contributed in the development in this proposal document. First and foremost, I would like to express my sincere gratitude towards our research supervisor Dr. Lakmini Abeywardhana who guide us in the right path towards success of this project. I also want to express my gratitude towards the members of my team for their commitment and the support given during this project. In addition, I express my gratitude towards the people who involved in the process and gave us information we needed. Finally, I would like to express my appreciation towards our management for giving us tools and opportunity we needed to complete this project. Their steadfast assistance and dedication have been essential in assuring.

Abstract

As we live in this fast-moving digitized world, having electronic devices has become a must in life. In such, it must to have the most suitable devices to cater your needs. Hence, in traditional days we tend to ask for such help or search for devices in all possible ways. Thus, it is best if we could have all in one place for us to identify the best device we need upon the requirement. Hence, myself and my team have proposed a chat-bot recommendation system for computers, accessories and repair centers. Thus, our title of this research project; “Chat-Bot System for Computers, Accessories & Repair Center Recommendation”

As we identified chat-bot system is the most novel approach for this. This system uses Natural Language Processing techniques to understand the user’s preferences and give them the optimum results. Furthermore, chat-bot systems are more likely to be lively in this fast-digitizing world. This abstract provides an overview of the chat-bot recommendation system, which is an innovative and user-friendly way to assist users in selecting the best solutions.

Thus, we are looking forward to give the best solutions towards users by collecting reviews of devices and repair centers. We are looking forward in web-scraping certain websites to gather our relevant data as well. In addition, we are introducing image processing in order to identify computer accessories without any difficulties All these features will be available through our chat-bot system such that any personnel with varying knowledge of electronic devices can get a solution without any hesitation.

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List of Abbreviations

Table 1 - List of Abbreviations

Abbreviation	Meaning
NLP	Natural Language Processing
BERT	Bidirectional Encoder Representations from Transformers

1. Introduction

The development of technology and e-commerce platforms has made it simple for people to buy for a variety of goods online. For many people, however, it can still be difficult to locate the perfect product. The battle can be broken down into other categories, such as determining the product's requirements and purpose, taking financial limits into account, and judging the product's durability. Because of their interdependence, choices made in one area may have an impact another.

Thus, enters Chat-Bot systems. Which helps users to feel more alive & a platform to suit their needs at its best. A chatbot system is made to mimic human communication and help users find the right items to meet their needs. With the development of technology, chatbots have gained popularity. Chatbots can offer relevant items and reduce shopping challenges by learning about customer preferences and requirements. The chatbot serves as an informed advisor, making suggestions based on criteria including purpose, price, and durability. Chatbots can assist users in making better educated judgments about their purchases and enhance their overall shopping experience in this way.

The very first Chat-Bot introduced to the world was “ELIZA”. From then onwards, use of chat-bots have drastically increased due to the reasons explained above. This is clearly showcase in the following diagram which is statistically proven in the research of “A literature survey of recent advances in Chatbots”. [1]

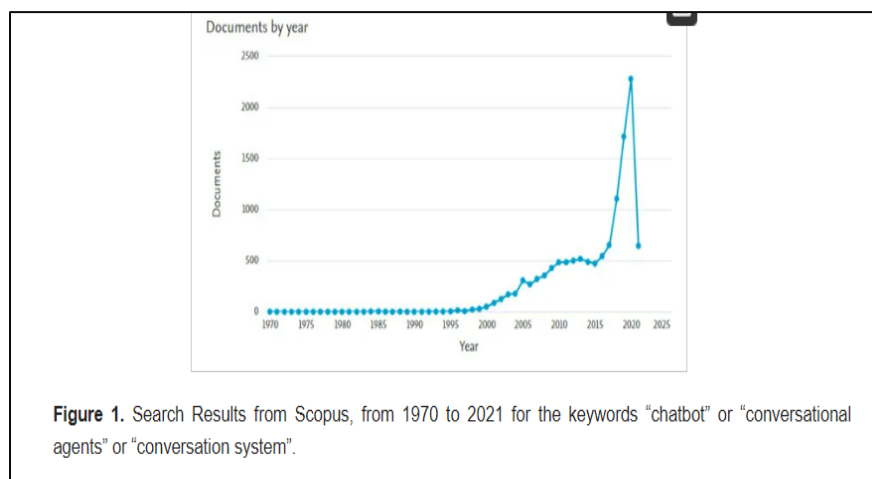


Figure 1 - Search results of Chat -Bot keyword

In this study, we will attempt to determine how well a chatbot's recommendation system works to meet user needs. We will also carefully examine any variables that may have an impact on customers' satisfaction with the chatbot system, as well as how the chatbot system can take users' daily activities to a higher level while requiring less time and effort. Last but not least, the goal of this research is to enhance the user experience and raise user satisfaction in the searching computers, computer accessories & service centers.

1.1 Background Literature

1.1.1 Prevailing Methods

Before we come across Chat-Bot systems, what are prevalent or current methods we are using in order to find a device that we need. Or a certain accessory, maybe a repair center. As usual, we turn into web browsers and search for the item in need. Per say, if we need to look into an device, we would search for brands, specific requirements and browse until we need what we are looking for. But in most cases, it is a lengthy process. We must investigate brands, device specifications & customer reviews and so on. Else, we would ask someone else's help, a technician per say. Not always it's under the same roof. Hence, how useful it would be if it was. That is what we are looking forward to creating in the project.

Below diagram shows that on average 10 hours has been spent searching for a new device. Thus, proving that it is a lengthy process via the survey we conduct.



Figure 2 – Survey - Time Spent Comparison

In most cases, if we are looking forward to purchase a PC and we visit a website, there are none to rare instances of Chat-Bot systems. What we will be able to find are filtration methods. In such cases, we lose the human touch and most

importantly, one who lacks device knowledge finds it hard to find a PC to cater his or her needs. Thus, its best if we could implement a Chat-Bot system to cater their needs.

In other cases, PC accessories are important as well. These can be external and internal hardware which cater many needs. This is a very useful part in which such Chat-Bot system may come in handy. Because, unlike looking for a PC/Laptop, people specifically lack knowledge in specific parts of a device. In tradition ways, we would turn over to a specialist or so. Similarly issue stands for PC repair centers. We would browse the web or so. Hence, as in this project we opt to cater all these needs under one roof to raise user satisfaction in the searching computers, computer accessories & service centers.

1.1.2 Understanding how Chat-Bot System Works

Now let us specifically look into how Chat-Bot systems works using below diagram.

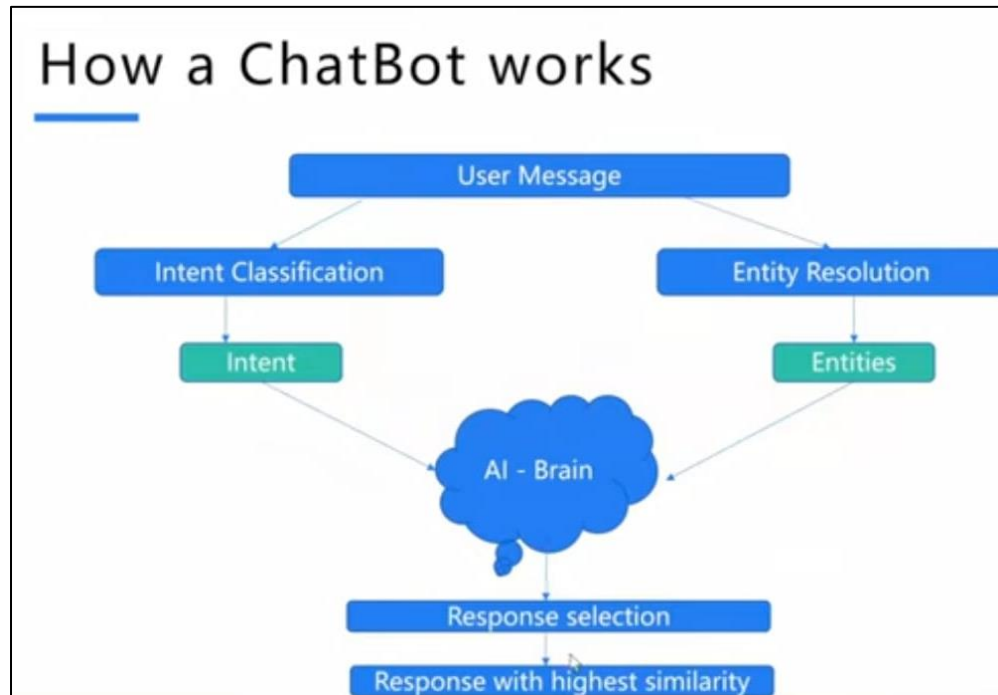


Figure 3 - How Chatbot works

First and foremost, the user will send a message/query. This is initially categorized into two as Intent Classification and Entity Resolution. Intent classification explains what the intent of the query is. For example, if the query starts with “Hi...”, this intent that the user is trying to start a conversation. Similarly, every user message has a certain intent. On the other hand, Entity resolution explains what entities are explained in the user message. This contains names of various objects, people and so on. Finally, combination of these keywords are sent to the AI – Brain which is basically NLP and processing those keywords. Finally, a suitable response is given by our recommender system.

1.1.3 Type of Chat-Bots

Since we have understood how Chat-Bot systems work, let's investigate what are the type of chat-bots with the aid of the following diagram. [2]

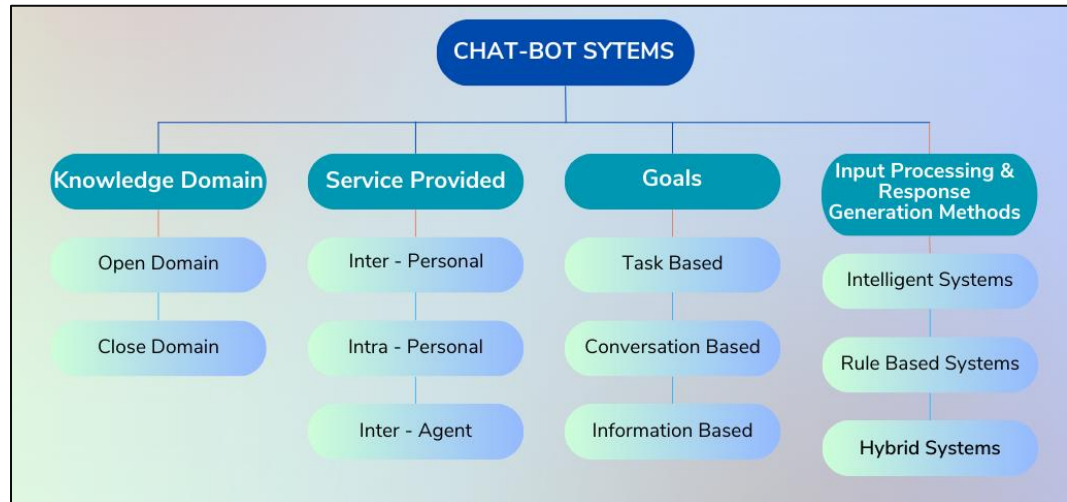


Figure 4 - Types of Chat-Bots

Chat-Bot systems can be categorized into several categories according different aspects. Let's drill down to understand how our Chat-Bot behaves.

(a) Knowledge Domain

a. Open Domain

Open Domain Chat-Bot systems have a huge variety of knowledge. It is not specified to a certain aspect. Best example for such systems is 'Alexa'. Where their domain knowledge expands into many areas.

b. Close Domain

Close Domain Chat-Bot systems are specified into a certain knowledge. They are train to provide a specific task in that particular area.

(b) **Service Provided**

a. Inter – Personal

These types of Chat-Bots provide a certain service without being a companion of the user. They just exist to provide a service to the user upon their request.

b. Intra – Personal

On the other hand Intra-Personal Chat-Bots deliberately become companions of the user and provide a service. These are much personalized to each user. ‘Alexa’ is a good example for intra-personal chat-bots.

c. Inter – Agent

These types of chat-bots are mostly used to communicate between two systems and provide a task. These are mostly automated between IOT systems.

(c) **Goal Based**

a. Task Based

These types of Chat-Bots accomplish a certain task such as booking a flight or so.

b. Conversational Based

As the name stands, these will mimic a conversation between the user and the chat-bot.

c. Information Based

Information based chat-bots will provide information based on the upon the user's need based on the information saved in their system.

(d) Input Processing & Response Generation Method

a. Intelligent Systems

Intelligent systems generate responses based on AI algorithms. They are capable of learning themselves to provide the best service towards the user.

b. Rule Based Systems

Rule based Systems are hardcoded within themselves. They are set to ask particular questions from the user to get the information as needed.

c. Hybrid Systems

Hybrid systems are a combination of Intelligent & Rule Bases systems comprising of vast capabilities.

1.2 Research Gap

1.2.1 Overall Research Gap

Throughout the history, there have been situations where Chat-Bot based E-commerce systems were implemented for various purposes. These were implemented to cater various needs and to make communication easier as well.

Such an example is “*Design and Implementation of a chatbot for e-commerce*” [3]. This system was mainly used for marketing purposes & make conversation faster. Thus, our proposed system also caters this need but in contrast, we will be specifying towards computers and the Sri Lankan market. Thus, a non-technical person will be able to find a device which caters their specific need. In addition, we will be looking towards online reviews and providing our customers with the most suitable devices.

Another such example is “*Development of an E-Commerce Chatbot for a University Shopping Mall*” [4]. This system seeks to provide an easy, smart, and comfortable shopping experience for the Covenant University Community. Whilst our proposed system will also cater this need. We are aiming to find users nearest and best service repair center to cater their need. In contrast, our system will read reviews of other customers through online reviews and give the best recommendation towards our customers.

“*A hierarchical recommendation system for online user reviews in e-commerce*” is the subject of research [5]. Approach primarily focuses on e-commerce platforms where a system uses online reviews to propose products to users based on their greatest user insights was created in a hierarchical manner, with many levels filtering applied to the final recommendation, and it made use of ML algorithms to examine the users' prior browsing and purchasing history.

In this particular research, “*Voice recognition system: speech-to-text*” [6] uses speech to text in a Home automation system. This is a very useful feature since in

our proposed system, we are proposing to use speech to text in order to gather useful keywords & data from online reviews. Thus, making the recommendation system even stronger.

So, lets breakdown how our proposed system’s features compare with these implemented systems.

Table 2 – Overall Research Gap Comparison

Research Reference	Using Online reviews for recommendation	Using Speech recognition	Using Video reviews for recommending products	Using image recognition	Using a Chat-Bot system
Research [3]	×	×	×	×	✓
Research [4]	×	×	×	×	✓
Research [5]	✓	×	×	×	×
Research [6]	×	✓	×	×	×
Proposed System	✓	✓	✓	✓	✓

Thus, it is clear now our proposed system contains a collection of useful features in order to optimize our Chat-Bot based recommender system.

1.2.2 Component Research Gap

Since, we have identified the overall research gap and why we need such a Chat-Bot based recommender system, let's identify what are similar cases in specific to Chat-Bot systems and how our Chat-Bot system stands out from the rest. First and foremost, there are many ways in which recommender systems can be implemented. Yet, we chose to implement this recommender system in the shape of a Chat-Bot system. One of main reasons is it is best way to interact with users in the most practical manner maintaining the human touch.

In addition to that, we were able to observe that more than 70% have not met such Chat-Bot Recommender system as shown below.

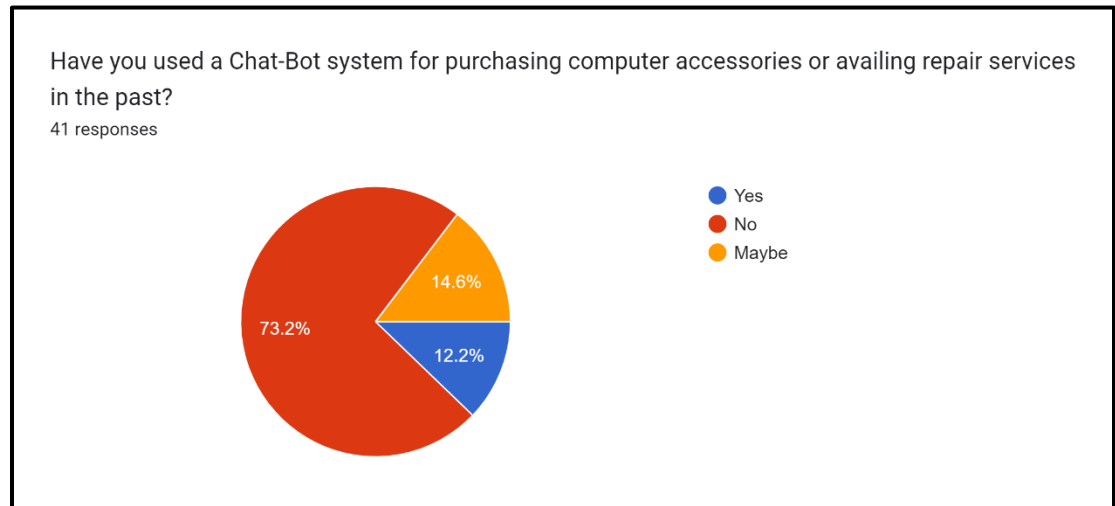


Figure 5 - Survey - Experience on Chat-Bot systems

Looking towards already existing chat-bots and their common drawbacks, the following were discovered.

- Limited Functionality – One of the major issues that Chat-Bot systems are facing is finding it difficult to understand multi – part questions.
- Not personalized & Lacks emotions - Most systems do not take the factor of user's emotions into account. Thus, making it difficult to give more personalized results to users.

In order to investigate how our Chat-Bot system brings novel to the users and fill the above drawbacks, let's further investigate how earlier mentioned types of Chat-Bot systems tally with our system.

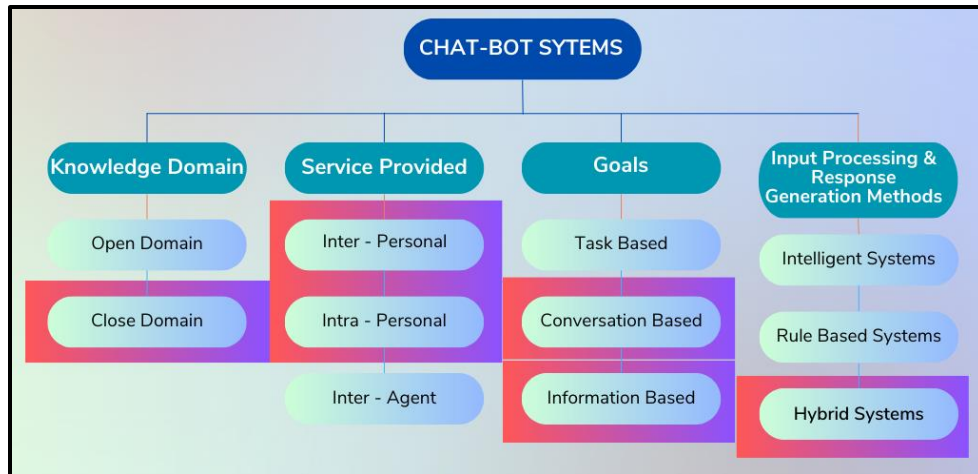


Figure 6 - Types of Chat-Bot compared to proposed system

Thus, as you can see highlighted sections will cater our system. In specific, since our system caters towards recommending devices it will be a close domain system. Furthermore, in order to understand user’s need we will be moving towards inter & intra personal Chat-Bot system. In such way we will be able to take the emotions of the users into account as well. In addition, in order to enhance the human touch within the system, we will develop a conversational & informational based system.

The most important of the above all is how we process the inputs and generate the responses. For this it is proposed to use a hybrid of intelligent systems and rule-based system such that we will be able to understand the user’s need exactly. Thus, making this proposed system a much overall user-friendly Chat-Bot system.

In addition, the below table will elaborate on how our Chat-Bot system compares with the others and how it stands out from the others.

Table 3 - Component Research Gap Comparison

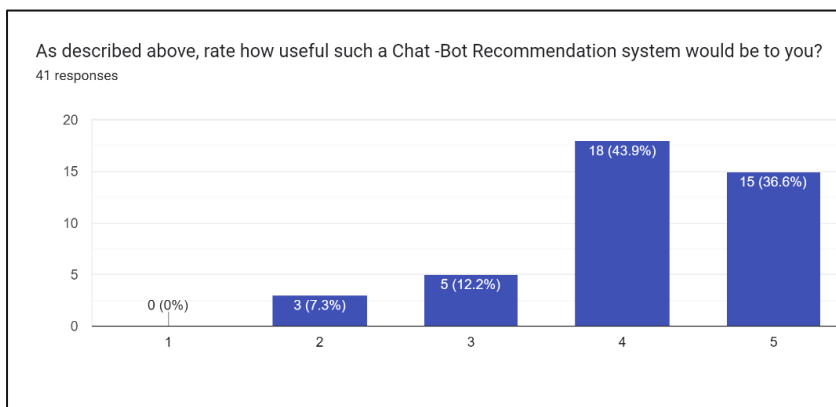
Research Ref. No.	Image Input Via Chat-Bot	Input & Response Generation Method
Research [7] <i>Sinhala Chatbot with Recommendation System for Sri Lankan Traditional</i>	X	Rule based System
Research [8] <i>Sentiment-based Chatbot using Machine Learning for Recommendation System</i>	X	Intelligent based
Research [9] <i>A machine learning based chatbot song Recommender</i>	X	Rule based System
Proposed System	✓	Hybrid System

2. Research Problem

In this modernized world, we still lack a comprehensive, specified & reliable method to identify computers, computer accessories as per users' specific needs. We still use traditional methods such as searching on a web browser, comparing each device and so on. These are much time-consuming methods and yet sometimes unreliable due to certain circumstances. Furthermore, sometimes we struggle to find a reliable repair center near us in order repair our electronic devices such as computers. Many people still use traditional methods by getting to know through contacts or so. In such cases, they may misguide you and you'll be ending up scammed. Hence, it is best to see real world reviews of majority of people and find the most suitable repair center in order to cater your need. Even when we enter a e-commerce website, you will be needing a specific knowledge about computers or so to find you a suitable device. Thus, you will be asking guidance from someone else.

Thus, we have proposed a **CHAT-BOT SYSTEM FOR COMPUTERS, ACCESSORIES & REPAIR CENTER RECOMMENDATION**. In this proposed system, we try to retain the human touch as much as possible by introducing a Chat-Bot system. Which also doubles as to increase user experience and usability as well. Let's dive into the research objectives to identify specific objectives of how we will cater the optimum Chat-Bot based system to users.

In addition, it was proven positive that implementing a Chat-Bot system for recommending devices is quite useful. This can be showcase from the below diagram which was extracted



from the questioner we carried out.

Figure 7 - Survey - Usefulness of Chat-Bot Recommender System

3. Research Objectives

As explained in the research gap & research problem, there stands a very useful use case in our system. That is to build the optimum Chat-Bot based Recommender system. Hence, the initial objective is to build a state of the art Chat-Bot system to properly identify users' need. In addition, as a member of this research project team, I'll be overlooking this area. Hence, we are focusing on using NLP methods and user-friendly UI to develop this.

Then we will gather data from Sri Lankan specific websites and online reviews from these as well. Furthermore, we will use speech to text in order to extract data from online video reviews and podcasts as well. Thus, optimizing the results at its best.

Next, we will use Image recognition in order to identify computer accessories and cater users need as per their query given towards the Chat-Bot system. Hence, we are focusing on getting inputs both as queries and images into our Chat-Bot system.

And last but not least, we are using online reviews in order to recommend the best repair center within a specific user. Thus, completing our Chat-Bot based system from end to end.

4. Methodology

Since, I will be overlooking the Chat-Bot part of our whole system, it is necessary to use NLP methods to identify the user queries. Furthermore, it should be optimized to input images to cater the image recognition system as well. Hence, it should simultaneously do both functions and work together to give the best result output to the user. Finally, after all the recommendation system have processed the data, the final output or outputs should be given back to the user within the Chat-Bot system making it more of a natural conversation.

4.1 System Diagram

Displayed here is proposed overall system diagram of our Chat-Bot recommender system.

It shows how both the query and image recognition works together or as individual components upon the users' need.

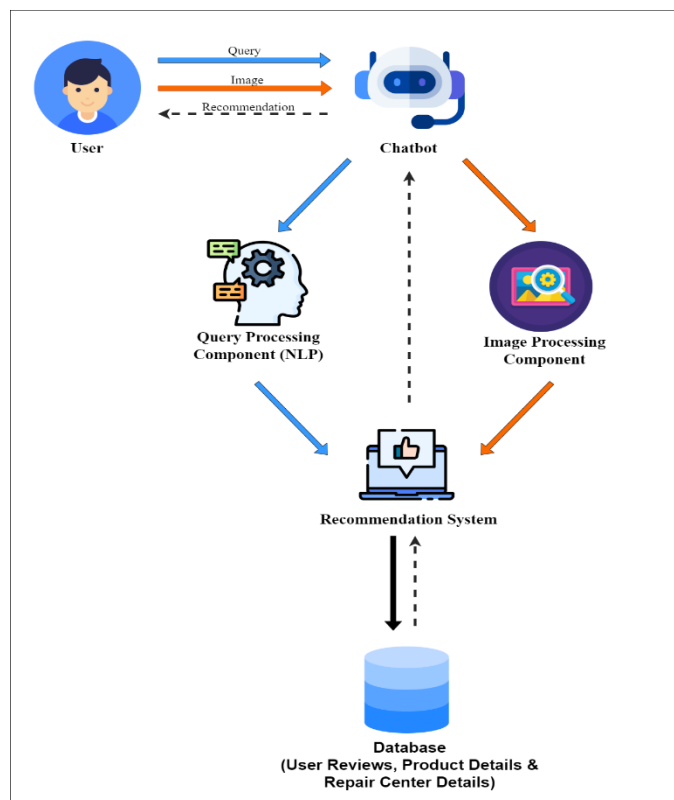


Figure 8 - Overall System Diagram

4.2 Component Diagram

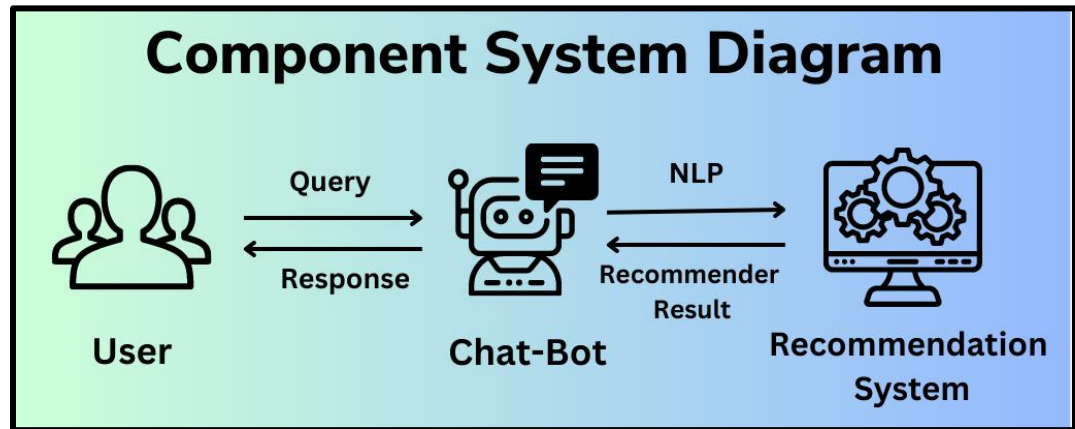


Figure 9 - Component System Diagram

Displayed above is the component system diagram. Once the user enters their desired query, it sends to the developed Chat-Bot system where it picks up the useful key words needed for the recommendation system. Once the recommendation system recommends a certain device the result is sent back to the Chat-Bot system where it is provided back to the user in conversational manner.

It is proposed to use a hybrid of RASA NLU and BERT along with pytorch for the development of the Chat-Bot system. Since BERT looks into benedictional scanning in sentences it will be able to understand intelligent based queries much faster. Since we are moving towards rule – based as well, it is better to incorporate the use of RASA NLU since it is best in handling shorthand queries.

4.3 Commercialization of the Project

Commercializing a Chat-Bot system for laptops, accessories, and service center recommendations can be a successful business venture if handled effectively. In order to do so there are certain factors to be considered.

The most initial and crucial factor is identifying the target market and potential buyers of the developed product. In that case, we propose this system towards computer selling companies. In such ways, they will be able to increase their sales & customer base as well.

In comparison to the competition seen in the available market, there are none to rare instances where we see Chat-Bot systems. Hence, commercializing such a product would be very useful. In addition, we don't see such system in the Sri Lanka market as well. So, implementing such a system would raise customer satisfaction and raise develop the competition in the Sri Lankan market as well.

As proposed, shown below is the product logo. We are targeting Sri Lankan e-commerce platforms, computer retail shops & repair centers to promote this product.



Figure 10 - Product Logo

4.4 Software Solution

The agile technique is a flexible and iterative approach to software development that places a strong emphasis on teamwork, customer engagement, and flexibility. Agile divides projects into sprints, which are typically one to four weeks long and are smaller, more manageable chunks. Each sprint is planned, carried out, and reviewed by the team as a whole, with a goal of producing usable software frequently and fast. Agile emphasizes regular communication and feedback between team members and stakeholders and places a higher importance on people and interactions than on processes and tools. Agile teams may create high-quality software that promptly and effectively satisfies the demands of the client by continuously adjusting to changing requirements and feedback.

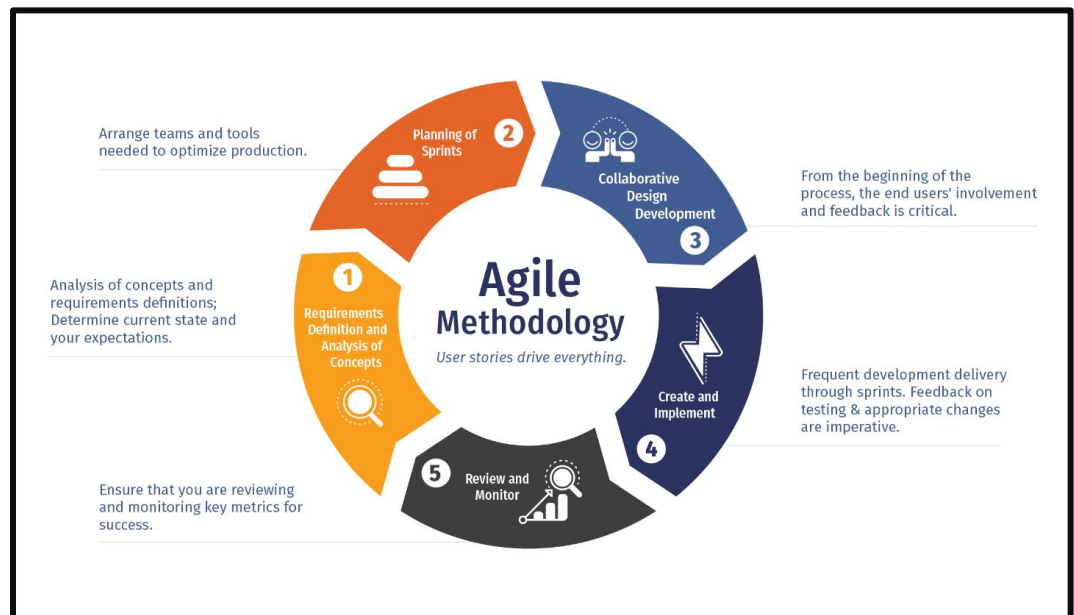


Figure 11 - Agile Methodology

4.5 Gantt chart

Shown below the work break down based on the AGILE methodology.

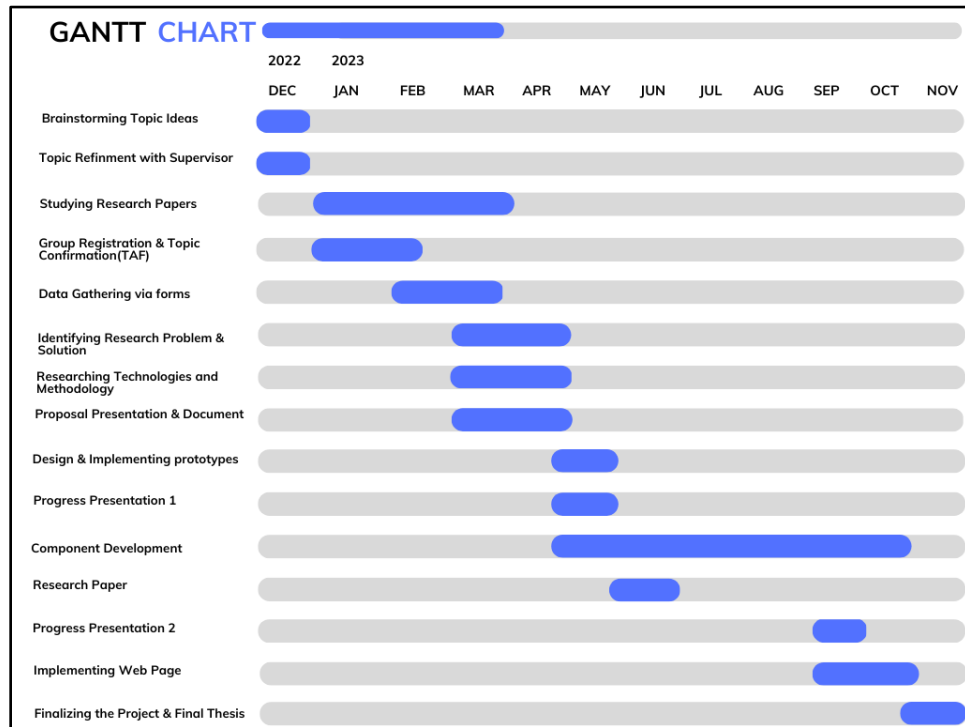


Figure 12 - Gantt Chart

4.6 Work Breakdown Structure

Shown below the work breakdown structure aligned to the above time frame.

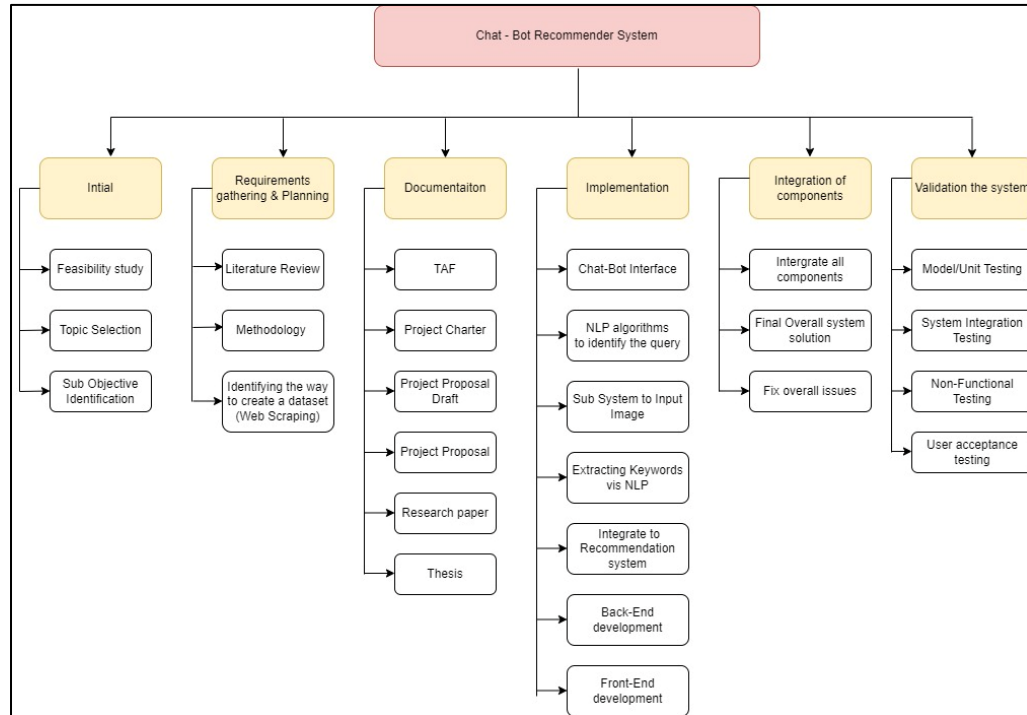


Figure 13 - Work Breakdown Structure

5. Software Specifications

As proposed for the moment we are looking forward using the following tools:

- IDE: VS Code
- Google Collab
- GitHub as version controlling
- Tensor Flow

Technologies:

- BERT & Pytorch / Rasa NLU

Implementation

- Web Application Development
 - Frontend Development - Preact
 - Backend Development – Python/Flask
 - Database – Mongo DB
 - Deployment - Cloud Platform – Google Cloud Platform (GCP)

6. Budget & Budget Justification

The total budget for this proposal is Rs.8,000, which will cover the expenses necessary for the project. Members of our team will bear this cost.

Materials and Supplies:

The materials and supplies cost are estimated to be Rs. 5,000. This includes the cost of Google Cloud Platform and other infrastructure costs, printing costs, and cost of other necessary supplies.

Other Expenses:

The remaining budget of Rs.3, 000 will be allocated for any other expenses that may arise during the research project, such as unforeseen costs related to the research design or implementation.

7. Conclusion

In conclusion, the E-commerce Chat Bot Recommender System for laptops is a cutting-edge technology that aims to enhance the online shopping experience for laptop customers in Sri Lanka. By utilizing chatbot and image recognition technologies, this system seeks to understand the specific requirements and preferences of customers, and provide them with optimum results, saving their time and effort. Additionally, by incorporating web-scraping and repair center recommendation features, the system is designed to cater to the needs of customers with varying financial status. Moreover, the image processing capability for computing accessory identification is expected to increase efficiency and accuracy. Overall, this system is poised to revolutionize the online shopping experience for laptop customers in Sri Lanka

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9. Appendices

1. Google Form used to information gathering: <https://forms.gle/FNLZidzXDE5MZKbX8>